Journal of Economic & Financial Research
ISSN : 2352– 9822/ E-ISSN : 2588-1574
Volume: 11 Issue: 01 / June –2024
P 683 - 704
OEB Univ. Publish. Co.

AI applications and digital marketing methods in healthcare services - Analytical Study-

Afif Abdeldjebar [1*] , Bentameur Keltoum [2]

[1] University of Mohamed El Bachir El Ibrahimi- Bordj Bou Arreridj- (Algeria), LEZINRU Laboratory, *abdeldjebar.afif@univ-bba.dz*
[2] University of Mohamed El Bachir El Ibrahimi- Bordj Bou Arreridj- (Algeria), *keltoum.bentameur@univ-bba.dz*

Received: *13/02/2024* ***Accepted****: 01/04/2024* ***Published:*** *30/06/2024*

Abstract:
The need to accelerate the discovery of medicines, vaccines and demand for digital healthcare services has increased as health organizations have worked to develop outlets and channels to reach their customers and improve interaction with them. This paper aims to analyse the relationship between the growing phenomenon of integration of AI applications into health service delivery and the evolution of digital marketing methods, using the analytical approach in the analysis of theoretical literature and previous studies and the analysis of statistics and reports from specialized statistical sites (statista.com). The study concluded that the diverse AI technologies built into the provision of health care services had led to the development of health digital marketing methods.
Keywords: Digital marketing, E-health, Artificial intelligence.
Jel Classification Codes: M31, I15, O3.

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[*]**Corresponding author:** Afif Abdeldjebar

1. Introduction

Digital technologies and health care are collaborating to revolutionize global health and further improve their practices, now; Patients have access to advanced treatments and improved diagnostic tools, as technological breakthroughs have changed healthcare work, leading organizations to adopt digital technologies where information is easily shared (Eric L. Swan, 2019, p. 603), To optimize opportunities and target customers by advertising and promoting their services (Radu. G, 2017, p. 44), As part of people's constant search for the sustainability of their physical health and mental well-being, they have become smarter and more selective (Kurolo, 2022, p. 318), where Consumers are looking for a comfortable and reliable user experience (Sahala Benny. Pasaribu, 2022, p. 2), This has led health organizations to learn and understand their customers' needs and desires to meet them to the highest standards (Radu. G, 2017, p. 44), while the healthcare sector is experiencing increasing levels of competition (Zhi-Wang. QIAN, 2018, p. 39).

Consultations, telemedicine, targeted treatment and mobile healthcare applications are examples of the technological and digital transformations that have contributed to the development and promotion of health care (Elad, 2023). With the rapid development of modern technologies to improve tele-health, the growing role of artificial intelligence has emerged, which is a vital element supporting the development of technological solutions (Sepideh. Bashang, 2023, p. 125), Its successful application in digital health marketing is due to the availability of big data sets and computing resources (Donato. Impedovo, 2019, p. 1) Overcoming the centrality of health care by addressing some of the pressing issues faced by organizations such as availability and accessibility, thereby radically changing their delivery methods (Sepideh. Bashang, 2023, p. 125)

Issue:

Despite the significant progress that digital and artificial intelligence applications have made in improving the way health services are delivered, there has been debate about their role in the

digital marketing processes of those services, as they raise questions about *how they contribute to the development of healthy digital marketing methods*

Relevance and objectives of the topic:

Integrating AI into digital healthcare service delivery has become one of the hot topics of the last few years especially after the Covid crisis, due to its ability to change how these services are provided and the growing call for ad hoc answers health-care providers face pressure due to changing demographics, administrative requirements, lack of manpower and increased morbidity, as well as changes in demand and expectations in technology.

The importance of this study is to know the extent to which health organizations can make the various changes necessary to adapt to new digital markets and renew patients' demands in a time of shifting views and trends. as well as their willingness to make digital marketing choices early enough to adapt to new market requirements, Change requires organizations to clearly recognize the need for such a shift and to chart a path towards adopting available options. This topic has not been directly addressed and is therefore a scientific attempt to enrich the intellectual product and consolidate the philosophy of modern health digital marketing based on emerging technologies

Study methodology:

Given the nature of the topic, the analytical approach was used to analyse and clarify the study's variables through numerous relevant references and previous studies on the relationship between the two variables, Where the study was divided into five axes, we first talk about the applications of AI in the field of health care followed by talking about health care and digital marketing and then we touch on the strategies of digital marketing in the health sector and then we review the levels of use of AI in the health sector and finally show the methods of healthy digital marketing in the adoption of AI applications.

2. AI applications in healthcare

AI research is essentially a collaborative endeavour involving scientists and experts from various fields including computer science, languages, soundology, mathematics and psychology. This branch of computer science is interested in making computers behave like humans (Rajiv, 2023, p. 2554)**,** we can only see an area from which we have taken a peer and companion as its applications gradually move into our daily lives and leave safe research boundaries. Artificial intelligence has the potential to automate routine tasks, improve decision-making and increase efficiency (Muhammad Farrukh. Shahzad, 2023, p. 1) among these areas is the healthcare industry.AI represents a wide range of technological developments that operate in a similar way to human intelligence, involving interaction, deep learning, cognition, adaptation and sensory perception (Kamal M. Alaskar, 2022, p. 1011) , it has several branches, including:

2.1 Machine learning:

It refers to many statistical techniques that make computers learn from experience without explicit programming. This learning usually takes differences in how the algorithm works. It is also a tool that facilitates healthcare providers' work in managing and caring for patients. Includes programming computers to mimic how humans think and learn (Ahmed .Al Kuwaiti, 2023, p. 3) . It aims to improve the speed and accuracy of doctors' work. Machine learning radically changes medical practice by involving doctors in thoroughly examining complex and diverse data sources. Its proper integration into the complex health sector revolutionizes diagnosis, prediction and care delivery (Nkirote, 2023, p. 1)

2.2 Deep learning:

Synthetic neural networks are used in deep learning, a type of machine learning, to simulate the work of the human brain. It has become increasingly popular because of its exceptional ability to learn from huge volumes of data. The use of machine learning techniques such as supervised, semi-supervised or unsupervised learning strategies to automatically learn in deep structures. Deep learning

techniques have proven to be effective in broadly analyzing data (Disha. Devassy, 2022, p. 1), Deep learning represents a combination that uses an algorithmic layered structure to look at process health data very quickly without room for error, and also uses mathematical structures that operate like the human brain while reviewing and not neglecting lost or forgotten data (Rehab A. Rayan, 2021, p. 5).

2.3 Natural Language Treatment:

Technology makes the machine more humane and thus reduces the distance between the two thoughts (Mah. Pascal Muam, 2022, p. 5). The analysis of linguistic data circulated is in the form of text data such as documents or publications and uses mathematical methods where the overall aim is to build a text representation that lends content and meaning to unregulated natural languages health care, the adoption of this technology in the processing of digital medical documents in many countries has been the consensus of many health care professionals. This is due to the fact that the traditional process is slow and boring and often ineffective, which can cause lower levels of patient health care. The abundance of physical medical records and documents already in place in many hospitals and clinics is a burden for health service providers, not to mention the lack of understanding of different formulas and handwritten notes, as well as incomplete information that has made the transition to electronic medical records necessary (Toh.Christopher, 2021, p. 2).

2.4 Artificial neural networks:

ANNs are novel systems and computational techniques for demonstrating knowledge, using learned information to optimize complicated system output responses, and machine learning (Dastres.Roza, 2021, p. 13) .Several studies focused on it in the field of medical diagnosis. They can be used to identify results that are almost impossible for humans to reach or even predict, as they often process all the data used to pre-train these models, they may include anything, whether electronic health records, MRI imaging, CT scans, etc (Kamal M. Alaskar, 2022, p. 1012).

2.5 Internet of things:

Is the sum of devices that can be connected to the Internet (Rayan.Rehab A, 2021, p. 1), Or all the machines and physical objects that have the ability to connect to the Internet where you receive a set of data and then sort it out and then share it and in simple words suggested by Kevin Ashton that everything in the real physical world, In the IoT it will have a digital analog as its virtual representation, initially it was just a technique that allowed for reading and tracking special information attached to certain themes of wireless frequency marks. To develop thereafter and be used in many areas including health in which wristbands are used to identify mother and child in maternity hospitals, Patients who need constant monitoring and reading of the patient's medical files containing everything related to him without reference to papers and documents.

3. Healthcare & Digital Marketing

3.1 E-health:

According to the WHO, The word digital health is used to refer to the innovative interdisciplinary field that combines technology and medicine. It is the field of study and research on the creation and application of digital technologies to promote health (Ting Fang. Tan, 2023, p. 1433), It is the set of services and techniques that allow patients to seek help without physically going to the hospital or clinic (Rowlands D. , 2019, p. 5), Mobile health applications, wearables, telemedicine and tele-health are examples of digital health, the link between health care and technology. Includes the collection, sharing and analysis of health data via digital ICT to enhance patient service (Zainal.Azaliza, 2023, p. 1826), Digital health includes information technology, big data and artificial intelligence to collect, share and analyze patient data to support healthcare professionals in making decisions and promoting patient care. It is also associated with electronic patient records applications, remote monitoring, connected devices and rehabilitation. (Apablaza. Juan, 2022, p. 2).

Healthcare marketers believe that their consumers expect individual experiences. According to the 2020 Allocation Trends Research,

enhancing customer experience (89%), enhancing loyalty (61%), and producing quantifiable investment returns (59%) are the key drivers of customization in healthcare organizations' marketing strategies, and the most intimate method is email (78%), According to the 2021 survey, five key interactions in which patients prefer digital connectivity are scheduling, completing paperwork, inquiring about services from providers, paying bills, and accessing their health information records, and most patients at present prefer to make their appointments online (via mobile apps or websites (Elad, 2023).

3.2 Marketing:

As a variety of marketing environmental factors have changed and evolved over the past century, so have marketing definitions. (J-Brunswick.Gary, 2014, p. 105) The American Marketing Association defined it as the process, organization and activities involved in the development, submission and handling of offers that are of value to partners, consumers, customers and the community at large, It was also defined as the study of laws and regulations affecting how goods and services are distributed, as well as the institutional role that provides consumers with end-products that are usable (Liu, 2017, p. 1) So we can say that marketing is the whole range of activities and actions undertaken by the organization from the customer's point of view to meet their needs and desires on the one hand and achieve their goals on the other.

3.3 Digital marketing:

Digital marketing refers to the promotion of goods or services through digital technology, and also includes advertising of offers, mobile phones and others (Desa, 2019, p. 196), It is also an effort that uses digital media and technology to help organizations achieve their marketing goals .(Worakamol. Wisetsri, 2021, p. 2605) .Digital marketing is the use of digital technologies such as smartphones, computers, media and other digital platforms to advertise goods and services (A.Lavanya, 2021, p. 677). Digital marketing refers to transforming traditional service delivery methods through the use of digital technologies to access and serve a large audience base.

3.4 Digital health marketing:

Given the growing reliance on digital media (online, mobile internet, etc.), one of the critical initiatives that organizations aim to implement is healthy digital marketing. In a fast-paced and interactive world, a health institution must embrace digital solutions or risk seeing a drop in demand for its services. (Worakamol. Wisetsri, 2021, p. 2606), Due to the sensitivity and protection of patients' health data, digital marketing of health care is carefully controlled with regard to promotion and contact with patients. (Worakamol. Wisetsri, 2021, p. 2602), In order to fully meet patients' wishes and demands, digital healthcare marketers must first recognize and understand them. In order to coordinate R&D and manufacturing across many stages of the healthcare industry where digital marketing solutions are necessary (Maksud, 2022, p. 319) Healthcare companies can connect patients and consumers successfully and efficiently through all digital channels by implementing a range of strategies and practices known as digital marketing. Providing customers with the information they need at the right time and location, these digital channels meet their needs as well as email, SMS, social media and web (cured, 2022). Health digital marketing is the adoption by health organizations of modern technologies and digital methods in providing their services more effectively.

4. Digital Marketing Strategies in the Health Sector

Explains the need for a comprehensive analysis of digital marketing tactics given the organizations' integration of technology into their marketing plan (Charles, 2018, p. 12) Digital marketing strategy outlines how to make marketing digital technologies more effective since they allow for personalized attention, better campaign management, product improvement, marketing design, and implementation (Mandal. Pinaki, 2017, p. 5428), It is a means of linking the organization's objectives to the results of implementing marketing plans that will be used or applied to customers (Rahman. Andri Nur, 2022, p. 73) Using the potential and challenges presented by digital media, digital marketing strategies are built on and

incorporate classic marketing ideas. (Sonia, 2016, p. 290) There are also many strategies available in the field of digital marketing of health care that vary according to researchers' perspectives, but most focus on:

4.1 SEO:

77% of people start their journey using search engines regardless of the user's overall itinerary, in fact, 70,000 healthcare searches are performed on Google every minute, representing 7% of all daily searches (digitalismedical, 2023), Google is one of the most important and crowded channels in today's healthcare sector. and search engine optimization is a well-known online marketing tool that refers to building a website and links to a particular website to optimize the site in search engine results pages, This tool makes it easier to find the organization's content and is a key element after content marketing that helps increase the visibility and discovery of content on search engines (Opreana. Alin, 2015, p. 31) 82.8% of patients search for an online healthcare provider using search engines such as Google, Bing, etc., and from 5% to 6% of patients use three separate Internet resources to find a doctor (digitalismedical, 2023).

4.2 Social media:

Interactions are two-way, with organizations providing patients with the information they need about their services. Patients always search for this information through interactions with them or other patients, and social media is promoted as a platform for user-generated information and interaction between organizations and patients, with a view to strengthening partnerships (GHAZI A. AL-WESHAH, 2021, p. 1)**,** When the pandemic broke out in 2020, social media was one of the best ways to communicate with patients, and 79% of patients sought social media from 2021 for detailed answers to questions about their health, with a large number of these discussions being held in small groups or with other patients**.** (digitalismedical, 2023).

4.3 Email marketing:

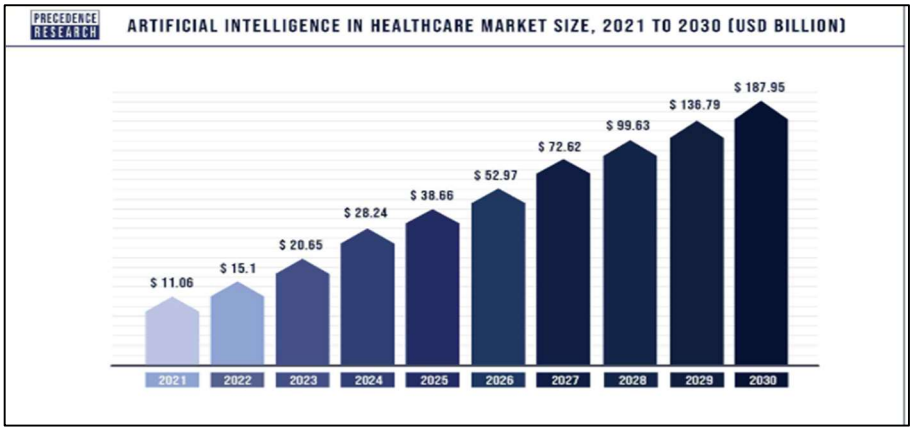
Email is the newest, most reliable instrument for e-commerce and marketing, making it the quickest way to communicate digital messages online (Sabbagh.Foued, 2021, p. 14) **.** The e-mail service provider - patient is defined as a computer-based communication between doctors and patients within a contractual relationship in which the healthcare provider bears an explicit amount of responsibility for the client's care (Danielz. Sands, 1998, p. 105)**,** Although a traditional marketing tool, email remains a viable healthcare marketing channel, and as of 2021, there were 4.1 billion active email users globally, with an average return on investment (ROI) of up to $ 36 per $1 invested (digitalismedical, 2023), Email marketing remains a lucrative strategy and the average e-mail opening rate for the healthcare sector is 21.48% and the average click rate is 2,69 for email marketing (digitalismedical, 2023) **.** Marketing through the organization's email to market healthcare content after is important, just as it is for other types of content.

5. Levels of AI use in digital health services

Patients may suffer from diagnostic errors, but thanks to AI systems more accurate medical records and diagnostic images can be created, especially in the early stages of the disease (Chopard. Bertrand, 2023, p. 1)**.** In digital fields, all health services consist of AI applications. Moreover, tele-health, artificial intelligence and other developing technologies augur well, but there are also obstacles to be addressed (Ting Fang. Tan, 2023, p. 1432) Health institutions may now work with qualified staff members thanks to the digitization of systems and infrastructure, which has also made it easier for personnel to learn new and advanced skills. As a result, there are now more jobs and professional prospects in the healthcare industry (Mijwil. Maad M, 2022, p. 25)Where has AI been used in healthcare across a wide range of clinical applications, such as genetic and molecular testing, medical images taken using different techniques, diagnostic codes, and social media. To create, test and validate algorithms, AI needs data from healthcare activities such as diagnosis, treatment and

follow-up. There are many different formats through which digital healthcare data can be found, such as structured and unregulated schemes (Martinez. Millana, 2022, p. 2)**.** Modern healthcare facilities are currently increasing the number of medical staff members involved in patient diagnosis and treatment for a variety of ailments by utilizing AI-enabled technology. AI technologies also have an impact on how well hospital management and nursing tasks are carried out (Lee. DonHee, 2021, p. 271)**.**

Fig.1. AI Market in Healthcare Sector



Source: (Research, 2023).

The report (statista.com) says that the smart health industry is projected to reach $187.95 billion by the end of 2030, and statistics indicate that in 2023 there was a massive surge in the size of this market worldwide. Global AI expenditure in the healthcare market was $20.65 billion. And the AI-based healthcare sector is expected to grow rapidly in the coming years, at a CAGR (CAGR) by 40.1% from 2023 to 2030, and the adoption of AI technologies in the healthcare area is expected to improve patients' conditions, reduce medical errors and enhance the overall treatment process**.** The adoption of AI has reduced treatment levels, creating about 80 MB of imaging data and electronic medical records annually (Elad, 2023).

Drug discovery was sped up by pharmaceutical corporations thanks to AI technologies in healthcare (Yousef, 2021, p. 3) Large amounts of digital medical data can be analyzed more quickly and

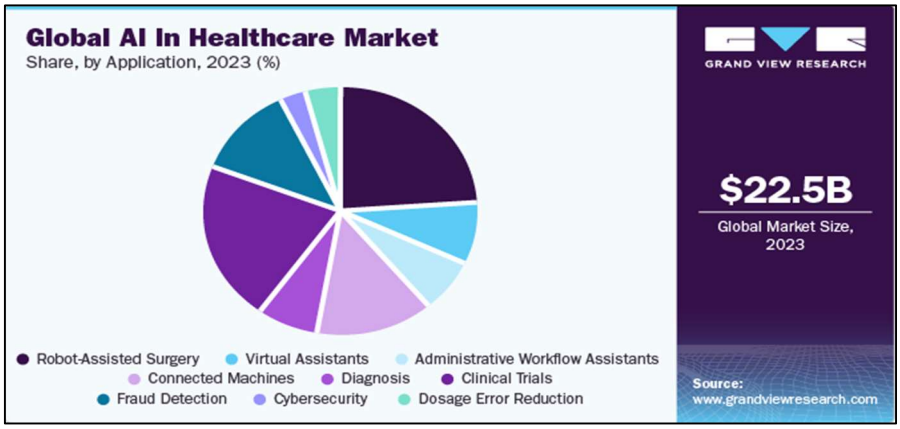
accurately, making it possible to identify patterns and relationships that can guide the development of new drugs. It also makes it possible to predict and test the effects of proposed medicines before they are marketed, thereby saving these institutions a lot of money. And reduce the amount of time it takes to discover new drugs by selecting the right individuals who can benefit from treatment when analysing their data (Hinkson. Izumi V, 2020, p. 1)**.** It is imperative to lower research costs and expedite the development of new drugs for the benefit of patients and pharmaceutical companies alike. Artificial intelligence tools are being used more and more in the search and development of new medications, and this could lead to potentially beneficial outcomes (Farghail. Hassan, 2021, p. 717)**.**

In addition, artificial intelligence allowed computers to adjust details of drug interactions and potential adverse effects after taking many of them simultaneously, whatever their type or size, causing a risk to the patient's health. projecting the risks of early severity of the disease has many advantages, such as reducing mortality rates, using fewer hospital resources, helping doctors make decisions and getting each patient the right level of medical care based on their severity ", reliable assessments using AI were carried out by automatically analyzing medical images, This reduces the burden of doctors, the time needed for diagnosis, and enhances the ability to forecast the discovery of a wider range of diseases.

AI recognition can also be evident in the growing number of healthcare companies that may invest in AI technologies. For example, IBM Watson Health, Google Health and Microsoft Healthcare are among the leading companies in the global market. This similarly highlights the increasing hobby of artificial intelligence and its recognition in health care (Elad, 2023). Some of the major companies investing in artificial intelligence includes IBM, Google, Microsoft, Amazon and NVIDIA. IBM's Watson Health platform uses artificial intelligence to help doctors make more informed decisions and enhance outcomes for affected people, Google's Deep Mind

Health uses artificial intelligence to help diagnose and treat diseases such as cancer and heart disease (Elad, 2023).

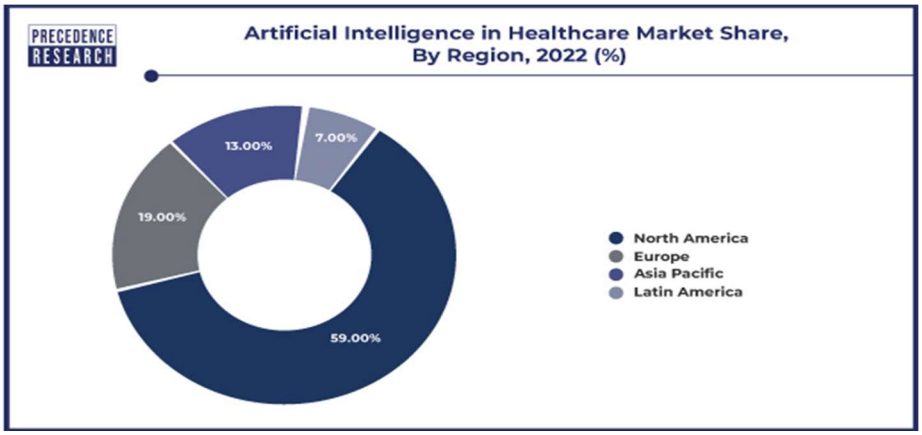
Fig.2: AI in health care - by application-



Source: (Research G. V., 2022)**.**

According to the above format, the robot-assisted surgery sector accounted for the largest share of revenue by 24.5% in 2023 and is expected to grow at a faster rate of 39.2% between 2024 and 2030, some of the key elements promoting the adoption of AI in robot-assisted operations include increasing the number of such actions as well as increasing funding for the creation of new AI platforms (grandviewresearch, 2022).

Fig.3: AI in Healthcare - by Region –



Source: (Research, 2023).

According to the above figure, the region with the largest market share is North America (59%), as it is known for its greater propensity to use the latest and most sophisticated digital technologies, helped by the development of artificial intelligence in the healthcare industry by strong and advanced ICT and healthcare infrastructure, overdependence to generate artificial intelligence, and growing demand for personal treatments (precedenceresearch, 2023), North America is a key place in AI implementation in health care, with North America's market size exceeding USD 187.95 billion in 2023, and is expected to see a CAGR of over 37% from 2023 to 2030 (Elad, 2023). According to Statista, the United States has become the leading AI patent country, with over 2,500 applications (Elad, 2023). The United States is one of the leading international sites in the adoption of AI in the healthcare sector at 55% in the second quarter of 2023, and Canada is also one of the leading countries in the United States of America in the adoption of AI in healthcare.

Europe is one of the key areas worldwide in terms of the adoption of AI in health care and the European AI-based healthcare sector reached $5.81 billion by 2023, while Asia and the Pacific region reached $5.5 billion. With a CAGR of 50.2% from 2018 to 2023, China is the largest market for artificial intelligence within the Asia-Pacific region with a share of 15% in 2023, while the Middle East and Africa region saw (MEA) A massive boom in the adoption of artificial intelligence (AI) in health care by 2023, and the onsite health care market is expected to develop at a complex annual boom rate (CAGR) at 8.3% and achieves a price tag of $535.7 billion by 2025 (Elad, 2023).

6. Healthy digital marketing methods in AI applications

Artificial intelligence (AI) has revolutionized the healthcare industry in the ever-changing world of digital marketing. AI changes the way healthcare providers communicate with potential patients, reach their audiences, and create tailored content (standard.com, 2023), AI applications have the potential to revolutionize the digital healthcare sector in ways beyond existing capabilities where their

huge potential lies in promoting patient care and improve diagnostic accuracy, as well as operational efficiency, as AI analytics platforms can help companies identify ideal consumers and understand their desires and needs and using this information to create targeted marketing campaigns that can be responsive to the target audience, Exploiting digital marketing for health through the evolution of AI applications helps to create new value for patients by improving the operational efficiency of health institutions.

Digital healthcare marketing spending is expected to account for 46% of total healthcare marketing spending, and digital platforms including Google and Facebook ads are likely to receive maximum funding for healthcare marketing (Elad, 2023). The use of artificial intelligence in the healthcare sector is growing in the coming years on the websites of health-care agencies using artificial intelligence, This growth is due to the growing demand for personal medicines and growing demand for reduced care costs, and growing data sets for digital data on patients' fitness in general s website traffic data indicate that AI is expected to have a high-quality impact on the healthcare institution, As more healthcare companies rely on artificial intelligence The number of visitors to these organizations' website is likely to increase as well.

6.1 Customized Marketing Initiatives:

Big patient data can be analyzed by AI-enabled analyses to deliver personalized healthcare. For example, regulating patients based on their health requirements, desires and habits, then using information to create marketing strategies that improve patients' outcomes. AI can help healthcare providers monitor patients' health status, identify potential health risks, predict effective treatment plans, and develop dedicated AI-supported treatment plans to help doctors provide the best possible care for patients. This can lead to lower medical costs and higher standards of care (Muhammad Miftahu.l Amri, 2023, p. 3).

6.2 Patient sharing with chatbots:

AI-driven chatbots can react instantly, in text or speech, when a patient asks a question on a healthcare organization's website or social media page. These chatbots can be useful in scheduling and providing details of services. AI-led chatbots are used to help doctors prescribe appropriate medications for their patients and answer their questions regarding new medicines and treatments, as well as provide basic medical advice (R. Jegadeesan, 2023, p. 6005).

6.3 SEO and content creation:

Because AI systems can recognize mainstream healthcare topics and keywords to ensure digestible content from the target audience and rank high in search engine rankings, they can help healthcare marketers produce high quality and relevant content (mitchell, 2023), AI in digital marketing can automate recurring tasks, increasing efficiency and allowing more time to deliver high quality care.

6.4 Data compliance and security:

Following data security and health care laws is crucial in the age of electronic health records. Because medical information systems often handle, display or store vast amounts of sensitive data, artificial intelligence can help healthcare organizations identify and mitigate security flaws (Abdulmohsen.Almalawi, 2023, p. 2).

7. Conclusions

The convergence between digital healthcare marketing and artificial intelligence is a transformative force that reshapes the patient care delivery landscape where digital healthcare marketing benefits from many digital technologies, online content strategies, personal communication with patients, the dissemination of healthcare information, and the promotion of services.

AI-driven virtual chatbots and assistants revolutionize patient engagement and support by providing prompt and accurate responses to queries, scheduling, and guidance on health-related queries. These AI-powered tools not only streamline patients' interactions, but also improve accessibility and convenience in healthcare services.

In addition, AI predictive analytics capabilities help healthcare providers anticipate patients' needs, enable proactive interventions, and improve resource allocation by identifying patients at higher risk or predicting disease progression, health care professionals can design interventions, which can prevent harmful health events and enhance patient outcomes.

In conclusion, the integration of artificial intelligence and digital healthcare marketing holds enormous promise in transforming patient care delivery. Embracing AI-enabled innovations enables marketers and healthcare providers to deliver more personalized, efficient and effective healthcare experiences And artificial intelligence empowers digital healthcare marketing through advanced data analytics, predictive modeling and machine learning algorithms, These tools enable healthcare marketers to analyze big data sets efficiently and developing actionable insights, predicting patient behaviors and preferences, and this data-driven approach allows targeted and personalized marketing campaigns, Increasing the importance of health information and services provided to patients, integrating AI into this landscape offers pioneering capabilities, enhancing patients' personal experiences and improving healthcare outcomes.

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